REMARKS

This is in response to the Office Action that was mailed on October 6, 2004. Claims 4-6 and 10 are cancelled, without prejudice. Clarifying formal amendments are made to claim 1. Claim 8 is supported by disclosure from line 21 on page 32 through lines 5 on page 33 of the specification. Claim 9 is supported by disclosure in lines 13-17 on page 11 of the specification. New claims 11 and 12 are based upon such disclosure as that appearing in lines 4-17 on page 11 of the specification. No new matter is introduced by this Amendment. Claims 1, 6, and 8-12 are pending in the application.

Objection was raised to dependent claims 4, 5, and 7. It is respectfully submitted that the objections are rendered moot by the cancellation of claims 4 and 5 and the present amendment of claim 7.

Claims 1 and 4-10 were rejected under the second paragraph of 35 U.S.C. §112. The Examiner indicated that the manner in which the plasma processing gas was defined in claim 1 rendered the claims indefinite. Claim 1 has been redrafted to more clearly define the plasma processing gas. Attention in this regard is directed to the disclosure appearing in lines 4-17 on

page 11 of the specification. It is respectfully submitted that the claims in their present form particularly point out and distinctly claim that which Applicants regard as their invention.

Claims 1, 4, 5, and 8-10 were rejected under the first paragraph of 35 U.S.C. §112. The Examiner notes that the previous amendment of claim 1 had removed the upper and lower limits set by the disclosed relationship "$2x10^{-7}$ (Torr/Hz)xf(Hz)≤P(Torr)≤500(Torr)". Those upper and lower limits are restored by the present amendment of claim 1. The Examiner also notes certain problems with the description of the plasma processing gas components in claim 1. It is believed that the difficulties noted by the Examiner are resolved by the present amendment of claim 1. It is respectfully submitted that the claims in their present form find full enabling support in the specification.

Applicants gratefully acknowledge the Examiner's indications on pages 4-5 of the Office Action that the claims herein are patentably distinguished over the Foster and Yamazaki references.

Claims 1, 4, 5, and 7-10 were rejected under 35 U.S.C. §102(e) as being anticipated by US 6,001,728 (Bhan '728). Office Action, pages 6-8. The rejection is respectfully traversed.

The Examiner alleges that the pressure range defined in claim 1 of the present application includes the pressure of the SiF_4 Example (col. 7, lines 39-49) and the pressure of the C_2F_6 Example (col. 8. lines 24-44) of Bhan. Applicants respectfully submit, however, that the rejection is based upon a misunderstanding of the contents of the "reactant gas group" of the present invention. In reality, the pressure range recited in claim 1 herein does not include the pressure of Bhan. The following is an explanation of the pressure differences between the present invention and Bhan '728:

SiF_4 Example of Bhan

When the conditions of Bhan (f=13.56MHz, P=4Torr, inert gas group: He (1500sccm), reactant gas group: SiF_4 (550sccm) + TEOS (98.36sccm) + O_2 (600sccm) are adopted in present claim 1, the partial pressure P_r of the reactant gas group becomes $P_r=4(\text{Torr})\times[\{550+98.36+600\}(\text{sccm})/\{1500+550+98.36+600\}(\text{sccm})]=1.82\text{Torr}$.

Therefore, the lowest value P_L of the pressure P of the present invention is the higher one of the following two:

$5\times P_r(\text{Torr})=5\times 1.82\text{Torr}=9.08\text{Torr}$; and

$2\times 10^{-7}(\text{Torr/Hz})\times f(\text{Hz})=2\times 10^{-7}(\text{Torr/Hz})\times 13.56(\text{MHz})=2.71\text{Torr}$.

That is, $P_L=9.08\text{Torr}$.

The highest value P_H of the pressure P of the present invention is the lower one of the following two:

$3.5xP_L(Torr)=3.5x9.08Torr=31.8Torr$; and

500(Torr).

That is, $P_H=31.8Torr$.

This gives a range of pressure P of

$$9.08Torr \leq P(Torr) \leq 31.8Torr,$$

which does not include the pressure P=4Torr of Bhan '728.

C_2F_6 Example of Bhan

When the conditions of Bhan (f=13.56MHz, P=5Torr, inert gas group: He (4300sccm), reactant gas group: C_2F_6 (400sccm) + TEOS (99.44sccm) + O_2 (840sccm) are adopted in present claim 1, the partial pressure P_r of the reactant gas group becomes $P_r=5(Torr)x[\{400+99.44+840\}(sccm)/\{4300+400+99.44+840\}(sccm)]=1.19Torr$.

Therefore, the lowest value P_L of the pressure P of the present invention is the higher one of the following two:

$5xP_r(Torr)=5x1.19Torr=5.94Torr$; and

$2x10^{-7}(Torr/Hz)xf(Hz)=2x10^{-7}(Torr/Hz)x13.56(MHz)=2.71Torr$.

That is, $P_L=5.94Torr$.

The highest value P_H of the pressure P of the present invention is the lower one of the following two:

$3.5xP_L(Torr)=3.5x5.94Torr=20.8Torr$; and

500(Torr).

That is, $P_H=20.8Torr$.

This gives a range of pressure P of

$$5.94\text{Torr} \leq P(\text{Torr}) \leq 20.8\text{Torr},$$

which does not include the pressure P=5Torr of Bhan '728.

Claims 1, 4, 5, and 7-10 were rejected under 35 U.S.C. §102(e) as being anticipated by US 6,106,659 (Spence). Office Action, pages 8-9. Claim 6 was rejected under 35 U.S.C. §103(a) as being unpatentable over Spence. Office Action, page 9. The rejections are respectfully traversed.

The Examiner argues that the pressure range of the present invention includes the pressure for set II (PET) sample 4 shown in Table 3 and the pressure shown in Table 7 (columns 24-25) of Spence. This may be so. However, the plasma treatment of Spence is for finely activating the PET surface as a pretreatment before lamination. Unlike the present invention, the Spence process is not aimed at improving the plasma processing rate. Spence fails to teach or suggest the pressure range of the present invention for achieving high rate plasma processing.

As to Table 7 of Spence, it is respectfully submitted that there may be a misunderstanding of the contents of the "reactant gas group" of the present application, as is the case in connection with the rejection over Bhan '728 discussed above. The pressure range of the claims of the present application does not actually include the pressure of Spence. Following is a detailed explanation of differences between the present invention

and: (i) Table 7 (columns 24-25) of Spence; and (ii) set II (PET), sample 4 in Table 3.

Table 7

When the conditions of Spence (f=13.56MHz, P=51Torr, inert gas group: He (1.71pm), reactant gas group: $SiCl_4$ (0.41pm) + N_2 (1.21pm) + N_2O (1.01pm) are adopted in present claim 1, the partial pressure P_r of the reactant gas group becomes $P_r=51(Torr)x[\{0.4+1.2+1.0\}(lpm)/\{1.7+0.4+1.2+1.0\}(lpm)]=30.8Torr$.

Therefore, the lowest value P_L of the pressure P of the present invention is the higher one of the following two:

$5xP_r(Torr)=5x30.8Torr=154Torr$; and

$2x10^{-7}(Torr/Hz)xf(Hz)=2x10^{-7}(Torr/Hz)x13.56(MHz)=2.71Torr$.

That is, $P_L=154Torr$.

The highest value P_H of the pressure P of the present invention is the lower one of the following two:

$3.5xP_L(Torr)=3.5x154Torr=540Torr$; and

500(Torr).

That is, $P_H=500Torr$.

This gives a range of pressure P of

$$154Torr \leq P(Torr) \leq 500Torr,$$

which does includes the pressure P=51Torr of Spence.

Set II (PET) sample 4 of Table 3

When the conditions of Spence (f=13.56MHz, P=56Torr, inert gas group: He (2.01pm), reactant gas group: C_2F_6 (0.171pm) are

adopted in present claim 1, the partial pressure P_r of the reactant gas group becomes $P_r=56(Torr)x[\{0.17lpm\}/\{2.0+0.17\}(lpm)]=4.39Torr$.

Therefore, the lowest value P_L of the pressure P of the present invention is the higher one of the following two:

$5xP_r(Torr)=5x4.39Torr=21.9Torr$; and

$2x10^{-7}(Torr/Hz)xf(Hz)=2x10^{-7}(Torr/Hz)x13.56(MHz)=2.71Torr$.

That is, $P_L=21.9Torr$.

The highest value P_H of the pressure P of the present invention is the lower one of the following two:

$3.5xP_L(Torr)=3.5x21.9Torr=76.8Torr$; and

$500(Torr)$.

That is, $P_H=76.8Torr$.

This gives a range of pressure P of

$$21.9Torr \leq P(Torr) \leq 76.8Torr,$$

which does includes the pressure P=56Torr of Spence. However, the plasma treatment of Spence is for finely activating the PET surface as a pretreatment before lamination (Table 3, column 21, lines 26-47, and column 19. lines 21-24). Spence does not achieve improvement in a plasma processing rate, which is achieved by the present invention.

In other words, Spence uses a high pressure of 50-800Torr for finely activating the PET surface (column 19, lines 14-17), and the pressure in one of its embodiments (P=56Torr) overlaps

the pressure range of the present invention $21.9\text{Torr} \leq P(\text{Torr}) \leq 76.8\text{Torr}$. Spence, however, does not teach or suggest the problem that the plasma processing rate decreases when too much inert gas is added. See the present specification, page 12, line 24 to page 13, line 5, and page 16, lines 1-11.

The Spence process is not designed, as is the present invention, to enable a least possible amount of inert gas within a range capable of stably maintaining the plasma to be added in accordance with the partial pressure of the reactant gas. Although the pressure in one of the Spence embodiments is coincidentally overlapping with the pressure range of the present invention, there is the problem in the prior art than an insufficient plasma processing rate can result when conditions such as the partial pressure of a reactant gas differ from those of the present invention.

For the above reasons, it is manifest that ***the present invention as a whole*** is substantially different from anything taught or suggested by Spence, and that one of ordinary skill in the art would not conceive of the present invention based upon the Spence disclosure.

Conclusion

Should there be any questions, the Examiner is respectfully requested to contact Richard Gallagher (Reg. No. 28,781) at the (703) 205-8008.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a one (1) month extension of time for filing a reply in connection with the present application, and the required fee of $120.00 is attached hereto.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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